

NEW SPECIES AND VARIETIES OF CONIFERS FROM MEXICO

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ABSTRACT

Four new species and six new varieties are described here; three species and two varieties of *Abies*, one species and three varieties of *Pinus*, and one new variety of *Pseudotsuga*. Within the genus *Abies* only one Mexican species was known with consistently more than two resin canals, and five having cones with enclosed bracts. The authors here report two additional (new) species, one from the state of Hidalgo and one from Oaxaca, with more than two resin canals and, including these, altogether three species with enclosed bracts. A new variety of *Abies guatemalensis* Rehd. was found in Guerrero. *Abies lowiana* (Gord.) A. Murr., often unreasonably neglected as a separate species and included in *A. concolor* (Gord. & Glend.) Lind. ex Hild. as its variety, is herein reported to be represented by a new variety in the state of Chihuahua. A distinct species of *Pinus*, discovered in Sonora, with five needles in a fascicle, stout branches, and strong scales such as in *P. michoacana* Mart., but with cones clearly placing this species in "*Pseudostrobus*" (like *P. estevezii* [Mart.] Perry or *P. nubicola* Perry). This new pine may play a key role in understanding the process of divergence of "*Montezumae*" and "*Pseudostrobus*" pines. A variety of the new species was also found by the authors in the state of Sinaloa. The southernmost localities of the genus *Pseudotsuga* so far were known from the states of Hidalgo and Puebla. The authors report on the species, as a new variety, further south, in Oaxaca. A new variety of *Pinus lawsonii* Roetzl ex Gord. and one of *P. oaxacana* (Mart.) Mirov is also reported from the latter area.

KEY WORDS: New taxa, Coniferae, México, *Abies*, *Pinus*, *Pseudotsuga*, Hidalgo, Guerrero, Oaxaca, Sonora, Sinaloa

NOTE: the species and varieties described here have been mentioned, along with a concise description and photographs, in the No. 6 issue of the NewsBrief of the International Dendrological Research Institute, Inc. (I.D.R.I.), Sep. 1994. The taxa "*Abies* A-E" are those listed in this article under numbers 1-5, "*Pinus* A-D" are those under 6-9, and "*Pseudotsuga* A" is under 10 in the list below (discussion). For information contact I.D.R.I., as given above.

INTRODUCTION

While documenting the Gymnosperms and their plant communities in México for the Dendrological Atlas project we encountered several conifers which we consider new taxa.

1: *Abies hidalgensis* spec. nov. (Hidalgo); 2: *Abies neodurangensis* spec. nov. (Durango); 3: *Abies zapotekensis* spec. nov. (Oaxaca); 4: *Abies guatemalensis* Rehd. var. *longibracteata* var. nov. (Guerrero); 5: *Abies lowiana* A. Murr. var. *viridula* var. nov. (Chihuahua); 6: *Pinus yecorensis* spec. nov. (Sonora-Sinaloa); 7: *Pinus yecorensis* Debreczy & Rácz var. *sinaloensis* var. nov. (Sinaloa); 8: *Pinus oaxacana* (Mart.) Mirov var. *diversiformis* var. nov. (Oaxaca); 9: *Pinus lawsonii* Roezl var. *gracilis* var. nov. (Oaxaca); 10: *Pseudotsuga menziesii* (Mirb.) Franco var. *oaxacana* var. nov. (Oaxaca).

For a long time (since 1932), only *Abies hickelii* Flous & Gausson, a species of southern México, was known to have more than two (typically 8-12) resin canals in its leaves (*A. oaxacana* Martínez is treated here as a synonymous with *A. hickelii*). A new species was found in the montane "cloud forest" region of Hidalgo (*Abies hidalgensis* Debreczy, Rácz, & Guízar, see below) with (typically 4-5) up to 7 median resin canals in the leaves, and soon after, surprisingly, another species with 4 resin canals was located in the similarly mild and humid habitat of a hidden valley in the state of Oaxaca (*A. zapotekensis* Debreczy, Rácz, & Ramírez, see below). The taxonomic value of the number and position of the resin canals is well discussed in the literature (Orr 1937; Liu 1971; etc.). Gausson (1971) thinks that marginal position of the resin canals is a younger character than median, supported by the observation that leaves on sterile shoots usually have marginal resin canals, while fertile ones of the same specimen are typically median (Ferré 1941). The phylogenetic importance of the resin canal number is little understood. Except for *A. hickelii* in México, only two species: *A. firma* Sieb. & Zucc. of Japan and *A. bracteata* (D. Don) A. Poit. of Pacific North America were known so far occasionally to have more than two, namely 4, resin canals. We suspect that this is either an ancient, "primitive" character or the consequence of rapid changes in climatic circumstances during the history of the species. In the ancient group of Gymnosperms, *Podocarpus* in a broad sense, there are several species with more than two resin canals--e.g., up to 10 in sect. *Eupodocarpus* such as in *P. rostratus* Laurent--and their position is typically median. Further study for the better understanding of the systematic position of these newly discovered relict endemic species, should involve the investigation of questions relating to the number of the resin canals.

There were only a few fir species known in México having enclosed bracts: excluding the southernmost types of *Abies concolor* (Gord. & Glend.) Lindl. ex Hild. known from northern México together with *Abies magnifica* A. Murr. in Baja California, only *Abies guatemalensis* Rehd. [not including *A. g.* var. *tacanensis* (Lund.) Mart. and the variety described here (var. *longibracteata* Debreczy & Rácz)], *Abies durangensis* Mart., *A. d.* var. *coahuilensis* (I.M. Johnst.) Mart. and *Abies vejarii* Mart. var. *mexicana* (Mart.) Liu. The first species was described by Alfred Rehder in 1939, the others by Maximino Martínez in 1942. More recently (1992, Biol. Sergio Zaimudo Ruiz of the Instituto de Ecología, C.R. Del Bajío, Patzcuaro, Michoacán reported (pers. comm.) a species from the state of Querétaro with two resin

canals and short, enclosed bracts. Our recent exploration extended this list by three more species having this character: *Abies hidalgensis*, *A. neodurangensis* Debreczy, Rácz, & Salazar, and *A. zapotekensis* (see below).

Abies guatemalensis, a species with enclosed bracts has an extended population in Guerrero with large cones and exserted bracts. So far only a southern form with fine needles, hairy branchlets, and smaller, narrow cones were known to have bracts exceeding the cone scales (var. *tacanensis*) from the high region of the Volcán Tacana, Chiapas. The variety, seems to be much more extended in México than the species itself, is described here as *A. guatemalensis* var. *longibracteata*.

Abies lowiana (Gord.) A. Murr., a species not consistently recognized by botanists and mistakenly, often included in *A. concolor* (*A. c.* var. *lowiana* [Gord.] Lemm.), is reported here from "south of the Rio Grande", north of the town of Madera, Chihuahua. With its *A. grandis* (Dougl. ex D. Don) Lindl. -like pectinate arrangement of the leaves on shade branches and young trees, a character which never appears in *A. concolor*, *A. lowiana* is more related to the previous species than to *A. concolor* in a strict sense. It is important to distinguish this species from the latter taxon, fairly frequent in the northwestern region of México. Found here with a surprisingly lustrous green foliage (always pruinose gray in the north), it is considered a new variety of *A. lowiana*.

Whether a pine species belongs to the "*Montezumae*" or "*Pseudostrobus*" group in classification is often difficult to establish. *Pinus yecorensis* Debreczy & Rácz has characters of both sections or subsections: the strong, thick branches with large, prominent primary scales suggest that it belongs to "*Montezumae*", while the cone is that of "*Pseudostrobus*". At this time, only the discovery of the species and a comparative morphology of this and some of the related species will be discussed. Chemical composition analysis and a more thorough study are still to come.

Pinus oaxacana (Mart.) Mirov is the most common species in Oaxaca between an altitudinal range of 1900-2500 m. With its long pendent, thin/fine shiny green foliage and the fairly large cones close to the apex of the strong branches for most of the year, this species is the most typical element of the "encinar y pinar" belt of the region. During our expeditions the variability of the species was thoroughly studied and a large number of samples collected. These proved a wide range of variability of the species, particularly in their cone morphology. A form with yellow (not purplish red) developing male strobiles is also worth mentioning here. While making this study, distant small populations with *P. montezumae* Lamb.-type elongated, just barely asymmetric cones of much less protuberant scales draw our special attention, particularly when noticing that this type consistently had brown branchlets instead of pruinose, typical for the species. If *P. montezumae* were present in the area, one would easily suspect that this pine is a hybrid between *P. oaxacana* and that species. Here we describe it as a variety of the Oaxacan pine, knowing that this solution may just open this taxonomic problem for further study and consideration.

Pinus lawsonii Roehl is the most common species of the relatively low altitude (1400-2500 m) coniferous forests of southern México. Over one hundred collections were made to observe its natural variability. Several types, which include trees with different growth pattern, color, or other characters of the needles, along with a wide range of the variability in the cones, were observed¹. We felt that all of them belong to the natural variability of the species and were not worth distinguishing with formal taxonomic epithets except for a type with smaller cones and conspicuously thin needles. This type, growing consistently in the lower limits of the distribution of the species, is treated here as *P. lawsonii* var. *gracilis* Debreczy & Rácz see below.

The distribution of the genus *Pseudotsuga* in North America has been known as far south as the states of Hidalgo and Puebla only. Recent discovery of the genus in the state of Oaxaca has extended the known distribution of the genus to 16° N lat., and the new location with those being discovered since the first report, represent the southernmost location of the genus worldwide. The Mexican Sierras, including the area of the Sistema Norte del Oaxaca, are known to be within an earlier wider range of the distribution of northern conifers including the genus *Picea*, known recently only as far south as the northern states of México. The (by now) isolated distribution of the northern taxa here, is practically just the continuation of their distribution southward (e.g., in *Picea*, that of *Picea pungens* Engelm. and *Picea engelmannii* Parry) with great morphological similarity to those of the northern ones, differing from them only in some characters and typically showing a wide range of infraspecific variability anyway (e.g., the length and thickness of the needles, number of the stomatophorus lines, shape of the cone scales, etc.). The Oaxacan Douglas fir is also just a southern representative of the variable northern *Pseudotsuga menziesii* (Mirb.) Franco segregated to isolated populations during its repeated migrations and survived in a wide range of different habitats representing a wide ecological spectrum. These ecotypes were separated on species rank (*Pseudotsuga flahaultii* Flous in Chihuahua-Durango-Zacatecas in the west, Coahuila-Nuevo León in the east, *Pseudotsuga guinieri* Flous in Chihuahua-Durango, *Pseudotsuga macrolepis* Flous in Chihuahua-Durango and Coahuila-Nuevo León-Hidalgo-Puebla, *Pseudotsuga rehderi* Flous in Chihuahua-Durango and Nuevo León). They are practically distributed throughout the range of the genus with geographic ranges that are close to or even overlapping one another. This "over-splitting" of the major species resulted in such "ridiculous" cases, that (for example) from just in the vicinity of Galeana, Nuevo León, three species of Douglas-fir were reported: *Pseudotsuga flahaultii* and *Pseudotsuga macrolepis* from Cerro Potosí, NW of Galeana, and *Pseudotsuga rehderi* from the Cañon de los Charcos, SE of the town. The extreme variability of the main species (Pacific and continental, Rocky Mountain forms) and the comparison of cultivated trees with wild specimens show the difficulty and weak basis of evaluating them as different species, or even as varieties. Dropping the idea of placing the Oaxacan Douglas fir under a "questionable" and ill-defined taxon such as, most likely, *Pseudotsuga macrolepis*, and considering the distant isolation of our taxon, we propose that it be separated on the level of variety within the main species. We are, however, aware of the fact that cultivation and further investigation which should include cold hardiness tests, may prove that this is not even a variety. Further data on the distribution of the species in Oaxaca (see description #10), reported soon after the first publication of our discovery in a local newspaper, indicate how widely the species was distributed in this region in earlier climatic periods.

1. *Abies hidalgensis* Debreczy, Rácz, & Guízar², *spec. nov.* Figure 1: c1-c3; Plate I:1; "Abies A" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. eastern Hidalgo: 4-5 km north of Metepec, 2300 m, June 12, 1994, Debreczy, Rácz, Biró *et al.* #40323 (HOLOTYPUS: BP; Isotypi: A, CHAP, E, MEXU, NA).

Arbor ad 18 m alta, trunco simplici; **habitus** columnari-conicus; **cortex** rasilis, in arboribus juvenilibus pallide cinereus, postea in laminas irregulares magnas ruptus, in arboribus vetustis valde crassus et suberosus, pars interior

corticis sanguinea; **rami** fusci, vel cinereo-fusci, usque ad 5-6 annos pilosi; **ramuli** validi, rasiles, pilis 0.2-0.3 mm longis, densis, flavo-brunneolis diaphanis cooperti; **gemmae** (partim foliis brevibus, incurvatis, terminalibus occultae) rotundato-desectae, tenuiter resinosa, squamis usque ad 15 triangularibus vel saltem apicibus squamarum tectae; **folia** pectinatim distributa, (1-)3-5(-6) cm longa, abrupte abbreviata (usque ad 1 cm longa) in ramulis externis leviter deorsum et/vel versus apicem ramulorum inclinata, aciebus parallelis, apicibus rotundata et breviter (0.2-0.4 mm), sed conspicue emarginata vel subtiliter bifida, in positione umbrosa mollia flexibilia vel in acumine arboris aliquantum quasi succulenta; pagina dorsalis eorum atroviridis vel glauco-viridis, lineis stomatum usque ad 14, in ramulis ad lucem expositis deorsum medium folii attingentibus, sed in positione umbrosa plerumque 6 lineis brevibus, ad apicem folii litteram "V" formantibus; pagina ventralis argenteo-cinerea cum margine angusto (0.2 mm), viridi et costa media 0.2-0.4 mm lata, saepe cum lineis stomatum infractis; limitibus lateralibus bilateraliter singulis argenteis, lineis stomatum typice 14-15 (in positione umbrosa in foliis angustis 5-6) instructis; lineis stomatum cum stomatibus 9 pro 1 mm; stomata 0.06 mm longa, elongato-ovata, intense pruinosa; folia ramulorum inferorum in sectione transversali plano-triangularia, sed ramulorum fertilium triangularia cum canalibus resiniferis medianis usque ad 7(!); **strobili feminei juveniles** 2.5-3.0 cm longi, bracteae eorum initio adpressae postea reflexae (4-5 mm), rotundato-triangularia, irregulariter serrato-incisae, pallide virides; **strobili masculini** 12 mm longi, pedunculo 3 mm longo, squamis pilosis circa 100 (20 × 5), 1.8 mm latis; **strobili maturi** 6.5-8.0 cm longi, 3.5-4.0 cm lati, pedunculo 0.4-1.0 cm longo, cylindranei, apice rotundati, leviter umbilicati; **squamae** 130-170 (25-34 × 5) pro strobilis, flabellatae, virides, glauco-virides, dense velutinosae, pili 0.2 mm longi, albidii, adpressi; **bracteae** 0.5-0.8 cm longae, sessiles, leviter spatulatae, cum ala acute inciso-serrata, rotundata, sine apice protrudenti; **axis** anguste-conicus; **semina** anguste-triangularia, resinovesicularia cum ala cinereo-straminea.

DESCRIPTION: tree with straight, typically single trunk, columnar-conical crown, first ascending, later descending branches, shiny- (or in sunny and dryer places) dull grayish-green, pruinose foliage; **bark:** smooth, light gray in young trees, later ruptured to irregular large plates, very thick and suberous on old trees with blood-red inner bark; **branches:** light brown, later grayish brown, hairy (up to 5-6 years); **branchlets:** rather strong, smooth, slightly prominent below the leaves on strong shoots, densely pubescent with 0.2-0.3 mm long yellowish brown, semi-clear hairs; **buds:** (partially hidden by short, incurving terminal leaves) flat, covered by up to 15 triangular scales or their tips, thinly resinous; **leaves:** pectinately arranged, "distichous", abruptly shortened (to 1 cm) on the upper (dorsal) side of the branchlets, slightly downward and/or forward curving, (1-)3-5(-6) cm, parallel sided, rounded and shortly (0.2-0.4 mm), but markedly, emarginate or finely bifid, soft flexible (shade) or rather fleshy (upper crown), shiny dark- or dull grayish-green with up to 14 stomatophorus lines on the upper (dorsal) side reaching below the middle of their length on stronger exposed stems, usually 6 short lines form a (0.6-1.0 mm long) "V" below the apex on shade leaves; lower (ventral) side is silvery gray with narrow green margins (0.2 mm) and midrib (0.2-0.4 mm, often with broken lines of stomata), two broad silvery stripes typically with 14-15 (in narrower shade leaves 5-6) stomatophorus lines with 0.06 mm long, elongated ovate, intensively pruinose,

densely set (9/mm) stomata; leaves in cross section flat triangular on lower, triangular on fertile branchlets *with up to 7(!) median resin canals*; **strobiles**: female- 2.5-3.0 cm long with short, first appressed later reflexed (4-5 mm) rounded-triangular, irregularly serrate-incised pale green bracts; male- strobile 12 mm long on 3 mm peduncle, consists of about 100 (20 × 5) 1.8 mm wide, hairy fertile scales; **cones**: 6.5-8.0 × 3.5-4.0 cm, short (0.4-1.0 cm) stemmed (peduncled), cylindrical with about 130-170 (25-34 × 5) cone scales; rounded, slightly impressed (umbilicate) at apex, pruinose green at maturity; **cone scales**: flabellate (wide cyathiform), green, grayish green, densely velutinous with short (0.2 mm), white, appressed hairs; bracts (0.5-0.8 cm) short, enclosed (sessile), slightly spatulate with sharply incised-serrate, rounded wings and without a protruding tip; axis narrow conical; **seeds**: narrowly triangular with resin blisters and narrow, light yellowish gray wings (not fully developed at the time of the description).

NAMED: after the central Mexican state of Hidalgo, where the species was found. The name also recalls Miquel Hidalgo y Costilla (1762-1811), a prominent personality of the post-Columbian Mexican independence movement, after whom the state itself was named.

DISCUSSION: this rare and distinct tree with 5-7 resin canals in the needles and green cones with short, enclosed bracts was located in the state of Hidalgo in an area where (in the wider region) only *Abies religiosa* (H. B. K.) Schltdl. & Cham. was known. The latter is completely different with its strongly curved, pointed (not bifid) leaves with two resin canals (not up to 7) and 2-3 times larger cones with long exserted, recurved bracts of prominent tip. *Abies guatemalensis*, a southern species with (typically) "bractless" cones not known as far north as Hidalgo, has twice as many leaves on an equal length of (shade) branchlet with straight needles curving to almost a right angle from the stem (not curved, directed forward), with two resin canals (not up to 7). In *A. guatemalensis* the cones typically pruinose blue (not pruinose green changing to light brown), have wide cyathiform "wing shaped" (not flabellate) cone scales with elongated (not short) basal section and slightly enclosed or finely exserted (not short, sessile) bracts with finely protruding (not absent) tip. Other species such as *A. vejarii* Mart. of northeastern México (with short, curved, succulent needles with two resin canals, close to or exserted bracts) are too distinct even to be compared with the new species.

DISCOVERY: the species was found in a deep canyon running eastward, 3 miles above the small village of Metepec. The first tree was seen on April 3, 1994 on the upper rim of the canyon just where the road makes a sharp turn downward toward Poza Rica and Tampico at an elevation of 2350 m. The tree, old and struggling with only a few upper branches alive, had no cones or cone axils, but the distinct foliage and bark immediately suggested that it does not belong to any species known. In this extremely cloudy area we had no opportunity to continue the exploration at that time. Sterile branches were transferred to the Division de Ciencias Forestales, Universidad Autónoma Chapingo (DCF/UACH) to preserve the (possibly sole) tree under #38672.

We returned to the area on June 12. This time we saw more trees deep in the canyon along with old cypress trees (*Cupressus lusitanica* Mill.). In spite of an early start, we had only a few minutes before the clouds filtered up and hid the valley. Realizing the difficulty of reaching the trees from our position and having no evidence of cones, we went to the section of the canyon where the lonely tree was found a few months earlier. We had good fortune for a few seconds and located a tree on a nearly vertical slope, 20 m above the right side of the river. The tree has had many cones which were not ripe yet but seemed to be fully developed in size. Soon we found it to be identical to our #38672, but it was much younger with different bark and less

glaucous needles (*DRB #40323*; type). Conifers associated with this fir are *Pinus patula* Schltdl. & Cham., *Pinus apulcensis* Lindl. (*P. pseudostrobus* Lindl. var. *apulcensis* [Lindl.] Shaw), and *Pinus teocote* Schltdl. & Cham. in its upper distribution, and (a few) *P. patula* in the evergreen cloud forest in the canyon. At the site of the specimen we found 36 accompanying species among which the dominating were *Quercus laurina* H. & B., *Ternstroemia pringlei* Rose, and *Cestrum fasciculatum* (Schltdl.) Miers. *Ipurpureum* (Lindl.) Standl. with *Alnus firmifolia* Fernald, *Buddleia cordata* H. B. K., *Ptelea trifoliata* L., *Sambucus mexicana* Presl., and *Syngonium podophyllum* auct.

PRÉSERVATION: Declaring the entire canyon as conservation land was proposed. Further study and conservation was planned in collaboration with Dr. Enrique Guízar Nolazco, DCF/UACH.

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2. *Abies neodurangensis* Debreczy, Rácz, & Salazar³, *spec. nov.* Figure 1: a1, a2 Plate I:2; "Abies B" in NewsBrief 6 of I.D.R.I. (Sep. 1994). **TYPUS:** MEXICO. southwestern Durango: near Los Bancos (Ejido la Victoria Paraje, San Antonio, Ejido El Brillante Paraje, Santa Barbara, Arroyo del Infierno), 2500 m, May 13, 1994, *Debreczy, Rácz, Biró et al. #39936* (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

Arbor ad 35-40 m alta, trunco simplici; **habitus** initio laxe conicus, postea densior, vertice rotundata; **cortex** rasilis, in arboribus juvenilibus pallide cinereus, postea in arboribus vetustis in laminas irregulares magnas ruptus, pars interior corticis sanguinea; **rami** ferruginei, usque ad 5-6 annos sporadice pilosi, pilis subtiliter pellucidis; **ramuli** pallide virides ad cinereo-brunnei, dense vel in positione umbrosa parce pilosi, pilis pellucidis 0.10-0.15 mm longis; **gemmae** in ramulis vegetativis typice subglobosae, 2-3 mm longae, non-resinosae, gemmae in ramulis terminalibus planae (6-7 × 3 mm) cum 12-18 squamis triangularibus, 3 mm longis, nitidis, brunneis costa prominenti et margine eroso instructis; **folia** dichotoma, late distantia, leviter ascendente, in latere superiori ramulorum prorsus inclinata, aciebus parallelis, apicibus rotundata et leviter (0.1 mm) emarginata; flexibilia, in pagina dorsali viridia, lineis stomatum usque ad 7 paene apicem attingentibus et lineis aliquot prope basin foliorum praeter costam impressam; in pagina ventrali argenteo-alba, cum margine angusto viridi (0.1 mm) et costa (0.25 mm lata), et limitibus lateralibus bilateraliter singulis argenteis, lineis (6-)9(-10) stomatum instructa; stomata 0.03 mm, ovata; folia in ramulis fertilibus saepe asymmetricè acuta, aliquantum succulenta cum limite pruinoso 0.2 mm lato superne lineis stomatum usque 8; costa crassa usque 0.7 mm lata, praeter costam lineis 6-8 stomatum angustis 0.35 mm latis; folia ramulorum inferorum in sectione transversali elliptico-avicularia, obovata, folia ramulorum fertilium in sectione transversali obovata (elliptica), canalibus resiniferis marginalibus 2, latero-ventralibus; **strobili** breves, columnares, 6.5-8.5 cm longi, 3.0-3.6 cm lati, initio virides, postea virido-brunnei, umbone prominenti; strobili velutini, pilis 0.10-0.13 mm longis, pellucidis,

erectis; **squamae** 150-200 (30-40 × 5), flabellatae; **bracteae** sessiles, 0.5-0.8 cm longae, ala angulari, protrudenti, apice 3-4 mm longo; **axis** angusticonicus; **semina** 0.8-1.0 × 0.8 cm, ala 1.0-1.4 cm longa, obtusotriangulari instructa.

DESCRIPTION: tree up to 35-40 m tall with single trunk, loose conical, later dense, round-topped crown with first ascending, later descending branches; **bark:** smooth light gray first, later ruptured, in old trees very thick, suberous with blood-red inner bark; **branches:** reddish brown, sporadically hairy with fine clear hairs up to 5-6 years; **buds:** vegetative buds typically subglobose, 2-3 mm long, terminal one flat (6-7 × 3 mm) on strong fertile shoots with 12-18 triangular, 3 mm long, wide, shiny brown scales with prominent midrib and eroded margin, not resinous; **branchlets:** light green to grayish brown, densely or sparsely (shade) hairy with 0.10-0.15 mm long clear hairs; **leaves:** on stem, "dichotomous", widely spreading, slightly ascending, forward curving on the upper side, 3-5 cm long, 1.5-2.2 mm wide, parallel sided, rounded and slightly (0.1 mm) emarginate at apex, flexible, shiny dark green above with up to 7 stomatophorus lines near the apex and a few lines down near the base of the leaves along the impressed midrib, the ventral side is silvery white with narrow green margins (0.1 mm) and midrib (0.25 mm) and two silvery stripes with (6-)9(-10) stomatophorus lines, stomata 0.03 mm, ovate, leaves on fertile shoots often asymmetrically (on one side) acute, more succulent with wide (0.2 mm) pruinose stripe above, with up to 8 stomatophorus lines, midrib strong, up to 0.7 mm wide, the stomatophorus stripes are narrower (0.35 mm) with 6-8 lines of stomata. In cross section the leaves are ellipto-aviculate to obovate (elliptical) on lower, obovate on fertile branchlets with 2 marginal latero-ventral resin canals; **cones:** short, columnar (6.5-8.5 × 3.0-3.6 cm) with prominent umbo, consist of 150-200 (30-40 × 5) conescales, bright light green first, greenish brown later, velutinous with 0.10-0.13 mm long upright clear hairs, conescales are flabellate with short (0.5-0.8 cm), enclosed (sessile), bract with protruding angular wings exceeding the 3-4 mm long apex; axis narrow conical; **seeds:** 0.8-1.0 × 0.8 cm with 1.0-1.4 cm long, rounded-triangular wing; fully developed but not mature when studied.

NAME: after the state where the species was found with *neo-* (Lat. prefix = new-) as anterior is to distinguish it from *Abies durangensis*, the well known and widely distributed (although not common) species of the region.

DISCUSSION: this fir with "*Abies grandis* (Dougl. ex D. Don) Lindl.-like" appearance is characteristically with two resin canals in its needles, the early appearance of the strobiles, and green cones with enclosed, sessile bracts. It was found in a canyon on the Pacific side of the sierra close to the Durango-Sinaloa border. Although enclosed bracts and two resin canals exist in the leaves of both, it can readily be distinguished from *A. durangensis* by its densely hairy, dark purplish brown (not subglabrous-glabrous yellow or pruinose) branchlets, glabrous (not thickly resinous), straight (not curved), green (not gray pruinose), rounded-emarginate (not pointed) leaves with median (not marginal) resin canals, cones with very short, enclosed (sessile) bracts with prominent, laminal wings forming a "V" exceeding the shortly protruding tip (not subsessile), nearly reaching the "exposure line" (the inner limit of the exposed part, "scale head" of the conescale) and triangular-acute at end. It has cones almost fully developed in size by the time *A. durangensis* "blooms". It is very distinct from and not even comparable to *A. concolor* or *A. lowiana*.

DISCOVERY: On May 13, 1994, while heading from Capilla Textla, Sinaloa to El Salto, Durango, just 3 miles before reaching the plateau, that is on the warmer, western side of the sierra (identified later as Ejido la Victoria Paraje, San Antonio and

Ejido El Brillante Paraje, Santa Barbara, Arroyo del Infierno), suddenly a fir with fully developed, although not mature, green cones came into sight. Traveling to document the cone-inflorescences (strobiles) of *Abies durangensis*, we were surprised to see a species in cone. Having the samples in hand, we realized that it was a completely different species, at first sight most similar to *A. grandis*, a species of the Pacific North. At an altitude of 2500 m, the trees are growing in the margin and upper part of deep canyons and associated with the dominating *Hydrangea seemannii* Riley and twelve other species such as *Alnus firmifolia*, *Cornus disciflora* DC., *Garrya laurifolia* Hartw., *Litsea glaucescens* H. B. K., and *Quercus magnoliifolia* Nee.

CONSERVATION: We found only a few mature trees. Although the difficult site seems to secure the species, the preservation of the habitat(s) is immediately necessary. Young plants are present, but not many. We reported to Dir. Tec. Felipe Norberto Coria Quinone and Biol. Rosalva Miranda Salazar at Unidad Conservación y Desarrollo (UCODEFO) No-6, El Salto, and proposed at least a few hectares of conservation land in the canyon. The protection seems to be secured and further studies are ongoing.

PARTICIPANTS IN FIELD WORK: Dr. Gyöngyvér Biró, Dr. Zsolt Debreczy, Dr. István Rácz, (I.D.R.I. and Hung. Nat. Hist. Museum, Budapest, Hungary), Eva Kertész (Botanical Collection, Munkácsy Mihály Múzeum, Békéscsaba, Hungary), Vince Zsigmond (University of Horticulture, Budapest, Hungary).

3. *Abies zapotekensis* Debreczy, Rácz, & Ramírez⁴, *spec. nov.* Figure 1: d; Plate I:3; "Abies C" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Oaxaca: Sierra de Juárez, near Portillo, 2700 m, June 30, 1994, *Debreczy, Rácz, Biró, et al. #40675a* (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

Arbor ad 20 m alta, trunco simplici; **habitus** laxe-conicus; **cortex** rasilis, arboris juvenilis pallide cinereus, postea in laminas irregulares ruptus; **rami** castaneo-brunnei, usque ad 5-6 annos sporadice pilosi; **ramuli** virides-flavovirides, tenuiter pubescentes, pilis 0.10-0.13 mm longis, leviter infuscato-subpellucidis, basin versus leviter contractis; **gemmae** (foliis brevibus, incurvatis, terminalibus partim occultae) rotundato-desectae, squamis usque ad 15 triangularibus tectae; externe non-resinosae; **folia** subdisticha, ascendencia, ad apicem leviter inclinata, litteram "V" patentem formantia, in ramulis lateris dorsalis aliquantum breviora et conspicue reflexa, 3-5 cm longa, 2 mm lata, aciebus parallelis, apice rotundata et breviter (0.14-0.20 mm) emarginata; flexibilia, aliquantum coriacea nitide atroviridia; folia cum/sine lineis stomatum usque ad 5, 2-3 mm longis, prope apicem folii, vel in ramis crassis lineis 2-3 deorsum infra medium folii; pagina ventralis argenteo-cinereus cum margine angusto (0.15-0.20 mm) viridi et costa media 0.2-0.4 mm lata, saepe cum lineis stomatum infractis vel a stomatibus omnino tecta, limitibus bilateraliter singulis argenteis, lineis stomatum typice 14-18 (in positione umbrosa in foliis angustis 10-12) instructis; stomata 12-13 pro 1 mm, 0.03-0.04 mm longa, anguste elongata; folia in sectione transversali plana, avicularia usque epsilon-formia cum canalibus resiniferis medianis 2-4(!); **strobili feminei juveniles** 3-4 cm longi, bracteis brevibus, initio adpressis postea reflexis (4-5 mm), rotundatis, irregulariter serratis, pallide viridibus, sine costa protrudenti marginem excedenti; **strobili masculini** 1.2 cm longi, squamis pilosis circa 100 (20 × 5) 1.8 mm latis; **strobili maturi** 8-9 cm longi, 3.6-4.2 cm lati, cylindranei, rotundati, virides, glauco-

virides, pedunculus 0.4-0.8 cm longus; **squamae** 150-190 (25-38 × 5) pro strobilis, aliformes, subtiliter velutinosae, pilis 0.03-0.06 mm, erectis; **bracteae** 0.8-1.0 cm longae, sessiles, apice leviter litteram "V"-formantes cum alis 2 inciso-serratis, fimbriatis costam non-prominentem excedentibus; **axis** anguste-conicus; **semina** 11 mm longa, 3 mm lata, ala 21 mm longa, 12 mm lata, cucullo 7 mm longo.

DESCRIPTION: tree with straight, usually single trunk, loose conical crown, ascending and horizontally spreading, later slightly descending branches, with shiny dark green foliage; **bark:** thin, smooth, light gray in young age, later ruptured to irregular plates; **branches:** chestnut brown, sporadically hairy up to 5-6 years; **bud:** (partially) hidden by short, incurving terminal leaves, flat, covered by a few, up to 15 triangular scales, not resinous outside; **branchlets:** green, yellowish green, thinly pubescent with fine (0.10-0.13 mm long), faintly brownish subclear hairs, slightly contracted toward their base; **leaves:** on stem "subdistichous", ascending, and slightly forward directed, forming an open "V" on the upper (dorsal) side of the branchlets, somewhat shorter and conspicuously reflexed when (in helical order) they reach or leave their uppermost position on the branchlets, 3-5 cm long, 2 mm wide, parallel sided, rounded and shortly (0.14-0.20 mm) emarginate, flexible and rather leathery, shiny dark green with or without up to 5 (2-3 mm long) stomatophorus lines on the tip of the leaves or on stronger branches with 2-3 lines reaching below the middle of the length of the leaves, their ventral side silvery gray with narrow green margins (0.15-0.20 mm) and midrib (0.2-0.4 mm), often with broken lines of, or completely covered by stomas and two broad silvery stripes, typically with 14-18 (in narrower shade leaves 10-12) stomatophorus lines with densely set (12-13/mm), fine (0.03-0.04 mm) narrow elongated stomata; leaves in cross section flat, "avicular" to "epsilon" shaped *with 2-4(!) median resin canals*; **strobiles:** female- 3-4 cm long, with short (4-5 mm), first appressed, later reflexed, rounded, irregularly serrate, pale green bracts with sessile midrib exceeded by the margins; male- 1.2 cm long on 3 mm peduncle, consist of about 100 (20 × 5), 1.8 mm wide, hairy fertile scales; **cones:** 8-9 × 3.6-4.2 cm, short (0.4-0.8 cm) stemmed "peduncled", cylindrical, rather smooth in outline with 150-190 (25-38 × 5) cone scales; rounded at apex, green, grayish green before fully ripened, cone scales are "wing-shaped", finely velutinous with very short (0.03-0.06 mm), upright hairs; bract short (0.8-1.0 cm), enclosed (sessile), slightly "V" shaped at end with incised serrate, fimbriate wings exceeding the non-prominent midrib; **axis** narrow conical; **seeds:** 11 × 3 mm, wing 21 × 12 mm with 7 mm long hood.

NAMED: after the indigenous people living in the area where the species was found. Zapotecs (here Zapotek to avoid the sound modification in Latin of "c" before "e") are the largest native nation of Oaxaca, with a macro-otomangue language and old culture (Monte Alban). They are by nature friendly and excellent in forest management and conservation.

DISCUSSION: this rare species with two to four resin canals in the leaves, green cones with short (sessile), inserted bracts, was found in a hidden valley of the cloud forest region northeast of the town of Ixtlán de Juárez, Oaxaca, in an area where only *Abies hickelii* and (very locally in the wider region but not near the site) *A. guatemalensis* was known. Although crown and foliage is similar at first sight, *Abies hickelii* is completely different with its slightly emarginate (not bifid) and very dark green leaves with up to 13 resin canals (not 2-4) and larger (10-12 cm long), blue-pruinose (not pruinose green) cones with long exerted, upright, pointed (not enclosed, sessile) bracts with prominent tip. *Abies guatemalensis* has similarly "bractless"

cones, but it has a denser foliage (close to twice as many leaves as it is in this species on equal length of comparable shade branchlets), straight and vertical (not subdistichous, partially ascending on the stem) and has two (not 2-4) resin canals. The cones of that species are typically pruinose blue (not green) with wide cyathiform "wing shaped" (not flabellate) cone scales with elongated (not short) base section, its bracts are slightly enclosed or occasionally finely exerted, (not short, "sessile"), with finely protruding (not absent) tip.

DISCOVERY: The species is known so far only from a wide valley about 10 km directly northeast of Ixtlán de Juárez, toward the place called Portillo, at an altitude of about 2700 m. We first visited this site in December 1991 and later on February 4, 1992. Faced with logging roads, often muddy and with many divisions, we asked the help of Mr. Gustavo Santiago Ramírez, a native of Ixtlán (then a biology student at the Instituto Politécnico Nacional, Ciudad de México) to help us in exploring the area. During our second trip with the local commissariat and with the guidance of Sr. Ignacio Crisocho, we made collections of a fir we considered to be *Abies hickelii* from a distance, but curious because of its green cone-inflorescences (DRB #32957a). On the basis of the different shape of the bracts and green color of the strobiles, we suspected that it was a new species and decided to make a new collection later. On June 30, 1994, we made a third trip to the area and we obtained full size cones which proved it to be a new species to science. Finally, in October, Mr. Gustavo Santiago Ramírez (DRB #41300) collected fully developed cones for further study. The cones this time of the year seemed to be mature, but still green. This new fir of the humid cloud forest ("bosque mesófilo de montaña") region grows on steep slopes in rich, mixed evergreen forests, associating with 65 (or more) species, including *Alnus glabrata* Fernald, *Arbutus xalapensis* H. B. K., *Clethra mexicana* (Lindl.) DC., *Comarostaphylis conzattii* Small / *arguta* Zucc., *Cornus disciflora*, *Crusea coccinea* DC., *Gaultheria hirtiflora* Benth., *G. acuminata* Schltdl. & Cham., *Quercus castanea* Nee, *Q. crassifolia* H. B. K., *Q. laurina*, *Senecio andrieuxii* DC. Completion of a vegetation profile of the habitat is in progress. More study is necessary to establish the full distribution of the species.

CONSERVATION: the habitat of this distinct, rare species is very important to preserve. Mr. Ramírez, in collaboration with Dr. Enríque Martínez y Obeja (Instituto Tecnológico de Oaxaca), works to secure conservation land around the habitat of the species and conduct further investigation of the distribution and habitat of the species. Seeds will be distributed from Ixtlán later.

PARTICIPANTS IN FIELD WORK: Sr. Ignacio Crisocho (Commissariat, Ixtlán de Juárez), Dr. Gyöngyvér Biró, Dr. Zsolt Debreczy, Dr. István Rácz, (I.D.R.I. and Hung. Nat. Hist. Museum, Budapest, Hungary), Vince Zsigmond (University of Horticulture, Budapest, Hungary), Mr. Gustavo Santiago Ramírez (SERBO Inc., Oaxaca).

4. *Abies guatemalensis* Rehd. var. *longibracteata* Debreczy & Rácz, var. nov. Plate I:4; "Abies D" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Guerrero: Sierra Madre del Sur, near Yextla, 2400 m, January 10, 1994, Debreczy, Biró, Rácz, et al. #34763 (HOLOTYPUS: BP; Isotypi: A, CHAP,E,MEXU,NA).

A specie typica strobilis maturis 10-12 cm longis, 4 cm latis et bracteis 2.0-2.2 cm longis, exertis differt.

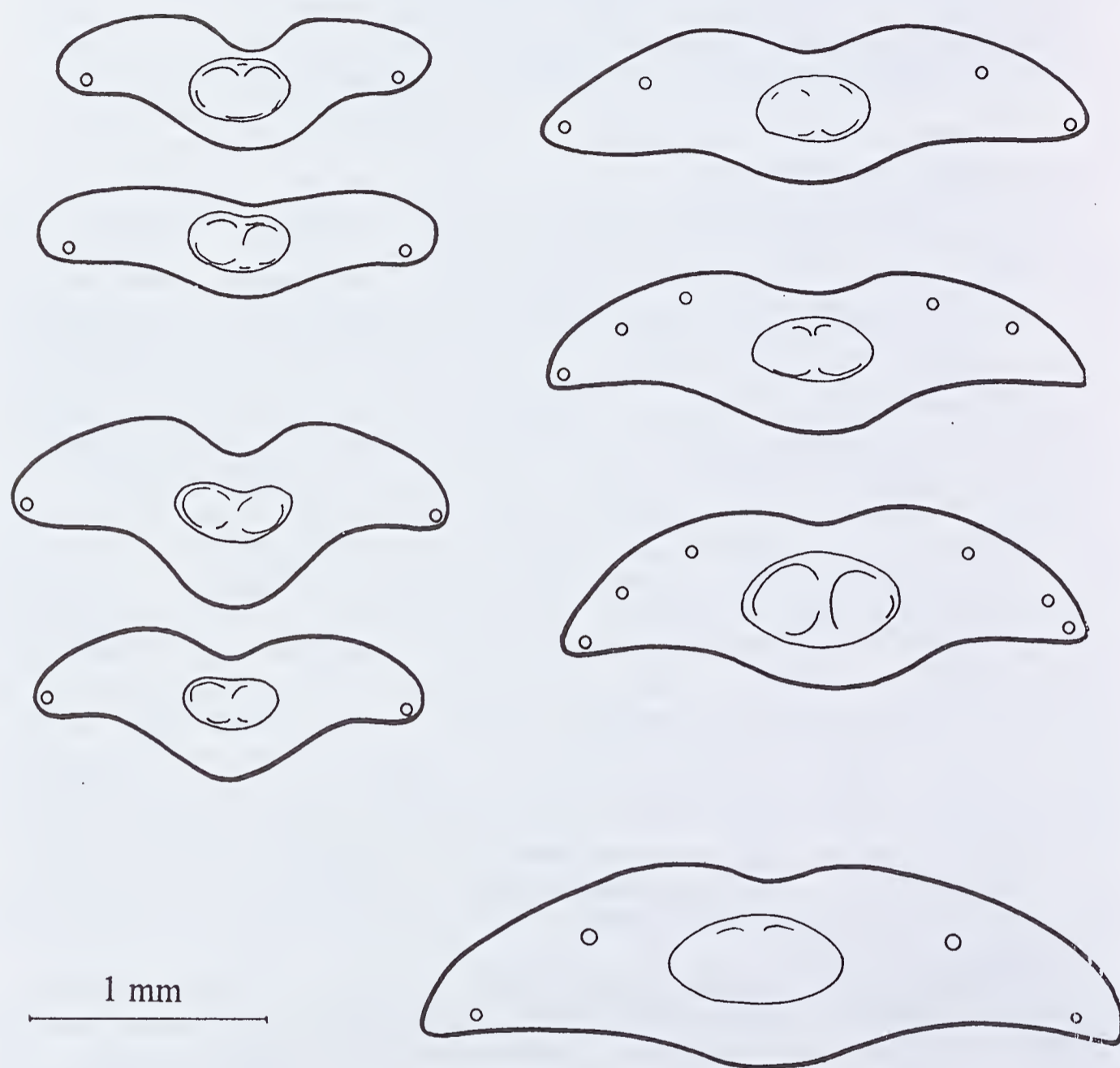


Fig 1. Analytical sketches of leaf cross sections of the new *Abies* species, partly in comparison with other species.

a1, a2: *Abies neodurangensis* sp. nov.

b1, b2: *Abies durangensis* Mart.

c1, c2, c3: *Abies hidalgensis* sp. nov.

d: *Abies zapotekensis* sp. nov.

Plate I



Plate I: cones of the newly described *Abies* species and varieties. 1: *A. hidalgensis* (resin canals 5, up to 7); 2: *A. neodurangensis* (resin canals 2); 3: *A. zapotekensis* (resin canals 4); 4: *A. guatemalensis* var. *longibracteata* (with its long exserted bracts).

Plate II



1



2



3



4

Plate II: newly described *Pinus* species and varieties. 1-2: cone and details of the crown of *P. yecorensis* (Sonora). 3: cone of *P. oaxacana* var. *diversiformis* (Oaxaca). 4: cones of *P. lawsonii* var. *gracilis* (Oaxaca).

NAME: *longus* (Lat. adj.) = long; *longibracteata* = long bracted; refers to the differentiating character of the variety in comparing the species.

DESCRIPTION: tree, identical with the species except for the larger cone (10-12 cm), the wider and longer cone scales (3.0-3.2 × 2 cm) with longer (2.0-2.2 cm) and prominently (4 mm) exserted, acuminate, upcurving bracts, and the wider, more angular, flabellate seed scale, wing.

DISCUSSION: comparing the variety with the typical *Abies guatemalensis*, it differs from the type in the size of the cones (10-12 × 4 cm; not 8-11), in the wider, longer (3.0-3.2 × 2 cm) cone scales with 2.0-2.2 cm (not 1.5-1.7 cm) long, acuminate bracts with long (4 mm) exserted, upcurving tip (not short, enclosed, abruptly acute or rounded at apex or with lateral wings, exceeding the tip) and by the more angular and flabellate (not rounded) wings. Other characteristics are equal with those of the species. *Abies guatemalensis* var. *tacanensis* (Lund.) Mart., reported from Volcán Tacaná from the state of Chiapas from between 3500-3800 m is similar, but the branchlets of var. *longibracteata* are glabrous or faintly hairy (not densely hairy), its leaves are longer, 3.5-5.5 cm (not 1.2-3.6 cm) long, the cones larger (not 10 × 4 cm), the cone scales larger (3.0-3.2 × 2 cm, not 2.7 × 1.5 cm) with consistently long exserted (not subequal to slightly exserted bract). The tree is fairly common in the Yextla area associating with over 65 higher plant species. Its plant communities are dominated by *Cupressus lusitanica*, *Quercus* spp. (4), *Chiranthodendron pentadactylon* Larreategui; among shrubs, *Dahlia excelsa* auct., *Mahonia lanceolata* Fedde, *Oreopanax xalapense* (H. B. K.) Decne. & Planch., *Philadelphus mexicanus* Schltldl., and *Solanum cervantesii* Lag. are frequent.

CONSERVATION: The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) lists *Abies guatemalensis* among the most protected conifers. This will not save the species itself: for example, logging in most areas where this conifer grows is common. Taking further steps toward full protection are needed, including preservation of the beautiful conifer stands with var. *longibracteata*. It is doubtful whether the new variety will be recognized as "CITIES 1" and distinguished from *Abies religiosa* (H. B. K.) Schltldl. & Cham., frequent in the area.

PARTICIPANTS IN FIELD WORK: Dr. Gyöngyvér Biró, Dr. Zsolt Debreczy, Dr. István Rácz, (I.D.R.I. and Hung. Nat. Hist. Museum, Budapest, Hungary), Eva Kertész (Botanical Collection, Munkácsy Mihály Múzeum, Békéscsaba, Hungary), Yinghao Zhao (Botanical Garden of the Chinese Academy of Sciences, Beijing, China).

5. *Abies lowiana* (Gord.) A. Murr. var. *viridula* Debreczy & Rácz, var. nov. "Abies E" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Chihuahua: Sierra Madre Occidental, near Ciudad Madera, 2700 m, May 6, 1994, Debreczy, Biró, Rácz, et al. #39711 (HOLOTYPUS: BP; Isotypi: A, CHAP, E. MEXU,NA).

A specie typica foliis ramulorum steriliis conspicue regulariter dichotomice ordinatis, in latere dorsali lucide viridibus; illis ramulorum fertiliis prorsum directis et parum declinatis differt.

DESCRIPTION: tree with straight, usually single trunk, loose conical crown, ascending and horizontally spreading, later slightly descending branches, with shiny light green foliage; bark: thin, smooth, light gray in young age, later ruptured to

irregular thick plates; **branches:** brownish yellow, sporadically hairy up to 5-6 years; **bud:** ovate, thickly covered by resin; **branchlets:** yellowish green when mature, thinly pubescent with fine (0.08-0.13 mm long) brownish, faintly brownish or subclear hairs, often long pointed widened at their base; **leaves:** on stem "subdistichous", spreading, slightly forward directing (shade) or upcurving (exposed) at right angle, forming an open "U" on the upper (dorsal) side of the branchlets, slightly shorter when (in helical order) they reach or leave their uppermost position on the branchlets, 3-5 cm long, 2.2 mm wide, parallel sided, rounded (fertile) pointed or very finely (0.04 mm) emarginate on shade leaves; leathery, shiny dark green above with up to 10 stomatophorus lines all along on middle of leaves, their ventral side greenish gray with narrow (0.2-0.3 mm) green margins and wider midrib (0.5 mm), often with few broken lines of stomas and two broad silvery stripes, typically with 9 (in narrower shade leaves 4-6) stomatophorus lines with moderately densely set (9/mm), fine (0.03-0.04 mm) oval stomata; leaves in cross section elliptical, with 2 median resin canals; **strobiles:** female- 5-6 × 0.8 cm with first appressed, later reflexed, short (4 × 5 mm), rounded triangular, irregularly serrate bracts with slightly prominent tip of the bract-needle (midvein), pale green or less often reddish green; **cones:** not seen, cone scales regular, as in the species.

NAME: *viridulus*, *viridula* (Lat. adj.) = greenish; refers to the color of the foliage, markedly distinguishes this geographically isolated variety from the northern type with gray, pruinose needles.

DISCUSSION: *Abies lowiana* was not distinguished and recorded in México so far. The species, mistakenly considered as a variety of *A. concolor* (*A. c.* var. *lowiana* [Gord.] Lemm.), should be considered as the "continental vicariant" of the Pacific species *A. grandis*. It is easy to separate it from *A. concolor* in the strict sense even by some prominent, easily available outer morphological characters: in *A. lowiana* the shade branches and branchlets are rough and hairy (not smooth and glabrous), the winter branchlets are brownish yellow (not greenish gray or gray); the leaves, positioned in regular helical order are spreading evenly out to horizontal position appearing "dichotomous" or "pectinate" on sterile, or pectinately upcurving in right angle to both sides of the branchlet on fertile shoots (not diverging in all directions according to the helical order and often curving back- and forward when in upper position). On primary terminal shoots, "leaders", the leaves are abruptly upcurving to parallel the shoot such as in *A. grandis* (not spreading or ascending up to 45°). They are 3-5 cm long, rounded at apex on regular shoots (not up to 10 cm or more, acute and abruptly pointed); the stomata arranged in two silvery stripes below, with up to 9 stomatophorus lines in each and in a defined central stomatophorus band near the central longitudinal groove above the midvein, with up to 11 lines (not evenly spread in both sides); in cross section the shade leaves are elliptical (not rectilinear); the cones of *A. lowiana* are typically conspicuously uneven in outline, light reddish brown, rarely green (not more or less even in outline, purplish, less often green). The variety (var. *viridula*) differs from the northern type by having less pruinose leaves above and shiny green leaves below. This could be a result of the ecological differences in the habitat of the two plants: such as the canyon environment with shorter dormancy period in the southern type, while exposed high mountain slopes with long winter and hot, dry summer in the northern one.

DISCOVERY: the species, represented here by the variety, is found in a canyon north of Madera, Chihuahua. We saw several specimens in the shady north-northeastern side of the wide valley about 10 km northeast of Madera, Chihuahua at an altitude of about 2700 m. We visited this site on May 4, 1994 and found the tree with

well developed female and male cone-inflorescences (strobiles). We asked the help of Mr. Leonel Iglesias Quitierrez, Director Forestal NC Chihuahua, Chihuahua, and M.C. Raul Narvaez Flores, Jefe del Campo Experimental Madera, associates of INIFAP (Instituto Nacional de Investigaciones Forestales y Agropecuarias), CIR (Centros de Investigación Regional del INIFAP) Noroeste to make this exploration possible. The trees formed a mixed stand with *Pseudotsuga menziesii* (Mirb.) Franco *s.l.*, with particularly big (some 120 cm DBH) specimens of the latter along the little stream in a side valley, all cut down in the near past. Other associated species include *Pinus durangensis* Mart., *Pinus ayacahuite* Ehrenb. var. *brachyptera* Shaw, *Acer glabrum* Torrey, *Arbutus glandulosa* Mart. & Gal., *Cestrum nocturnum* L., *Cornus sericea* Michx., *Juniperus deppeana* Steud. var. *robusta* Mart., *Lonicera involucrata* (Rich.) Banks, *Lonicera pilosa* (H. B. K.) Willd., *Mahonia repens* (Lindl.) G. Don var. *pumila* (Greene) Fedde (or a form of *M. eutriphylla* Fedde), *Populus tremuloides* Michx., *Quercus candicans* Nee, *Ribes madrensis* Coville & Rose, *Salix gooddingii* Ball., *Salix* sp., *Symphoricarpos rotundifolius* A. Gray (the other 35 herbaceous or semiwoody species include *Erigeron*, *Euphorbia*, *Fragaria*, *Galium*, *Gnaphalium*, *Lupinus*, *Luzula*, *Poa*, *Polypodium*, *Plantago*, *Potentilla*, *Ranunculus*, *Rubus*, *Senecio*, *Thalictrum*, *Valeriana*, *Veratrum*, and *Viola*).

CONSERVATION: the habitat of this distinct fir, probably rare in its southern range, would be very important to preserve. Sr. Leonel Iglesias Quitierrez, Director Forestal Noroeste Centro, Chihuahua, Chihuahua, and M.C. Raul Narvaez Flores, Jefe del Campo Experimental Madera had been asked to collaborate in securing the species and to work on the possibilities of the conservation of the land around the habitat, also to conduct further investigation of the distribution and habitat of the species and this variety.

PARTICIPANTS IN FIELD WORK: Dr. Gyöngyvér Biró, Dr. Zsolt Debreczy, Dr. István Rácz, (I.D.R.I. and Hung. Nat. Hist. Museum, Budapest, Hungary), Eva Kertész (Botanical Collection, Munkácsy Mihály Múzeum, Békéscsaba, Hungary), Vince Zsigmond (University of Horticulture, Budapest, Hungary).

6. *Pinus yecorensis* Debreczy & Rácz, *spec. nov.* Plate II:1-2 “*Pinus A*” in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. southeast Sonora: near Yécora, 1800 m, May 9, 1994, *Debreczy, Rácz, Biró, et al.* #39798 (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

Arbor 18 m alta, trunco simplici, recto; **habitus** late conicus (“araucarioideus”); **truncus** juvenilis diametro 10 cm et plus cortice exaratus, dense squamosus cum squamulis facile separabilibus panniculos pallide ferrugineos relinquentibus, postea fuscus usque atrocinereus; in truncis 40 cm diametro 7 costae discontinuae laminarum corticis (25-40 × 5-10 cm), laminis 2 cm crassis, planis, rotundato-angularibus; **rami** crassi (in arboribus vetustis 3 annorum 3 cm diametro), foliis persistentibus 4 annorum; rami conspicue squamati, squamis magnis, aurantiaco-brunneis, ultra 5 annum squamae primordiales cinereae; squamae corticis ultra 8 annum plane evolutae; **ramuli** crassi, dense squamulosi, glabri; **brachyblasti** cum squamis non-deciduis, squamae basales valde carinatae (4 mm), squamae superiores 5, tenues, rugosae, et superius filiferae; in arboribus adultis squamae primordiales primum longe decurrentes, postea basi breve (6 mm), cordata, lucide aurantiaco-brunnea cum apice filifero, longe acuminato; **folia** 5 pro fasciculis, ad basin crassa cum squamis basalis validis, 4.0-4.5 mm longa;

28-35 cm longa, in sectione transversali paene equilatero-triangularia, in latere dorsali 1.2-1.4 mm lata, dense serrata, lucide viridia, in latere dorsali lineis 3-4 stomatum, in lateribus ventralibus 3 lineis, margine tenuissimo (0.06 mm) instructa; dentes in aciebus foliorum densae (4-5 pro 1 mm), effusae, tenues (0.03 mm), pellucidae; **strobili feminei juveniles** ovales, 2.0-2.5 cm longi, 1.5-2.0 cm lati, ex 200 squamis compositi; squamae 3-4 mm longae, ad 2.0-2.5 mm ascendentes, flavo-brunneae, pruinosae (hinc subroseae), in apices 1 mm longos, rectos, obtusos, verticaliter expansos terminatae; pedunculo 1.2-1.4 cm longo; **strobili maturi** 8-12 cm longi, 6-9 cm lati (inclusi), 7.0-9.5 cm lati (aperti), ovati, circa medium latissimi, leviter asymmetrici, quasi sessiles, firmiter affixi, non-serotini, pallide brunnei; strobili ex 130-150 (26-30 × 5) squamis compositi; apophysibus planis vel protuberantibus, retrorse-rotundatis, umbone 3.5 mm longo, 2.2-3.0 mm lato, cum aculeo inconspicuo, obtuso, 0.6 mm longo terminato; **semina** ovata, 6.5-4.0 mm longa, in latere ventrali levia, ordinatione mosaica pallide brunnea, pallido- et atrocinerea, latere dorsali aspero, subtiliter sulcato et variole notato, superius pallide flavo-brunneo; ala 3 cm longa, infra medium latissima, latere interiore recta, semen ad basin circumdans.

DESCRIPTION: tree, 18 m tall, with straight, typically single trunk, broad conical ("araucaroid") crown, with upcurving, ascending, horizontally spreading and upcurving, finally descending or declining thick primary branches with relatively few (usually 25-30) lateral branches with large clumps of heavily pendent, shiny bright green foliage; **trunk:** straight, usually clean, up to 4-10 m; **bark:** ribbed from 10 cm upward, densely scaly with easily attached plates leaving light reddish-brown patches, changing to grayish brown to dark gray (at 40 cm DBH: 7 discontinuous ribs of 25-40 cm × 5-10 cm and 2 cm high flat topped rounded-angular plates); **branches:** thick (mature tree, 3rd year fertile: 3 cm across), leafy for 4 years, prominently scaly with large orange-brown, later, (from year 5), gray, eroded primordial (primary) scales; cortical scales appear from year 8; **branchlets:** strong, densely scaly, glabrous; **brachyblasts:** with non-deciduous scales (sheaths), basal scale pair strongly keeled (4 mm), upper scales 5 in number, thin, wrinkled and filiferous at margin above; **leaves:** 5 in a fascicle thick at base (4.0-4.5 mm at basal scale pair), 28-35 cm long, 1.2-1.4 mm wide on dorsal side, triangular in cross section, densely serrate, shiny bright green with 3-4 stomatophorus lines on dorsal and 3 on the two inner (ventral) sides, margin very narrow (0.06 mm), teeth densely set (4-5/mm), spreading, fine (0.03 mm), clear; primordial leaves of young plants (euphyllum) not studied; on adult plants the scales are first long decurrent, later the base is short (6 mm), cordate, shiny orange brown with filiferous, long acuminate apex; **conelets:** large to the genus (2.0-2.5 × 1.5-2.0 cm), oval, on 1.2-1.4 cm long stem, subtended with recurved or revolute entire bud scales, consist of about 200, 3-4 mm wide 2.0-2.5 mm high, elevated, yellowish brown, pruinose (hence pinkish) scales, terminated in 1 mm long vertically spreading straight blunt tips; **cones:** medium sized, 8-12 × 6-9 cm when closed, 8-12 × 7.0-9.5 cm when open, ovate, widest in the middle of its height, slightly asymmetrical, nearly sessile, firmly attached, non-serotinous, pale brown, the 130-150 (26-30 × 5 developed) scales have flat or protuberant, slightly retrorse, rounded apophysis with 3.5-5.0 × 2.2-3.0 mm umbo terminating in inconspicuous (0.6 mm) blunt prickles; **seeds:** small, ovate, 6.5 × 4 mm, smooth with pale brown, light- and dark-gray mosaic pattern on lower/ventral side, uneven, finely grooved and warty, pale yellowish brown above. The wing is 3 cm long,

broadest below the middle, straight on inner side, light yellowish brown with some dark shade and lines toward the edge.

NAME: after the mountain village Yécora in western Sonora, above which the species was found.

DISCUSSION: This very distinct new pine from the high mountains of Sonora has five needles in a fascicle and, in general appearance, it is very much like *Pinus michoacana* Mart., but with conspicuous, shiny light green (not dull grayish green) needles and very different cones, somewhat similar to the northeastern species *Pinus estevezii* (Mart.) Perry or to its close ally, *Pinus apulcensis* of central México. The cone is also comparable to *Pinus nubicola* Perry of the very south. It differs from *P. estevezii* with much thicker branches (3 cm; not 1.4 cm in third year), green (not pruinose) branchlets, larger primordial (scale) leaves (1.4 × 0.4 cm, not 0.8 × 0.2 cm), longer and thicker (28 × 6 mm, not 16.0 × 3.8 mm) enclosed (basal) section of the stronger (1.3 mm, not 0.8 mm) and less densely serrate (40 teeth, not 50 teeth/cm) needles. The cones of *P. yecorensis* are somewhat smaller (10-12 × 7-9 cm, not 12-14 × 8-10 cm), widest in the middle (not toward base), with rigid (not flexible) cone scales, light brown (not reddish-chestnut brown) around the seed print with light (not reddish brown) attachment zone below the more rounded-protuberant apophysis on the dorsal (abaxial) side, with larger umbo ended in short (0.7 mm) and blunt (not 1 mm, pointed) arista. The seeds have a brown (not black) pattern on the ventral side, with wings more gradually (not abruptly) narrowing toward the tip. Easy to distinguish *P. yecorensis* from *P. engelmannii* Carr. common in the lower region of the area with its bark (flat, shallow ribs, thin plates change light brown to dark gray, not high, dark gray ribs with conspicuous orange fissures), 5 needles/fascicle with 3 stomatophorus lines on dorsal side and three resin canals in each (not 3 needles, with 7-8 lines, 5-8 resin canals) and shorter, thicker (28 × 6 mm, not 30 × 3 mm) enclosed section of the needles. The tips of the conelet scales in *P. yecorensis* are horizontally spreading and pruinose (not directing downward, not shiny brown), the cones are egg shaped with rounded somewhat flat triangular tip of the scales with short blunt umbo (not long cylindrical with triangular, abruptly elevated scales with prominent, prickly umbo). *Pinus michoacana* with its sparse, thick branches is very similar in habit, but *P. yecorensis* has shiny green needles of thick (7-8 mm) base, 3-4 stomatophorus lines and narrow margin with spreading teeth on dorsal side (not 4.5 mm wide at base, pruinose grayish green with 6-8 lines, margin [0.15 mm] and teeth directing somewhat inward). The cones are very different in *P. michoacana*, they are long (20-30 cm), cylindrical, often curved. Compared to *P. yecorensis*, *P. durangensis* Mart. and *P. maximinoi* H.E. Moore, present in the region, have slender stems, finer needles and much smaller cones with thin, flexible scales, not comparable with our species.

DISCOVERY: On the way from Barranca del Cobra on May 8, 1994, we turned on the road leading to the town of Obregon. Just 12 miles before reaching the mountain village of Yécora, we saw a few strange, long needled, young pines in the dark along the roadside. They were neither *Pinus durangensis* nor *Pinus maximinoi*. Next morning, we returned to the area and found adult trees forming scattered stands in a dry canyon, associated with *Pinus herrerae* Mart., *Arbutus arizonica* (A. Gray) Sarg., *A. glandulosa*, *Quercus candicans* Nee, *Q. coccolobaefolia* Trel., *Q. magnoliifolia*, *Quercus* spp., *Prunus serotina* Ehrh. subsp. *capuli* (Cav.) McVaugh, and *Rhamnus betulaefolia* Greene. The altitudinal range of the species, around 1800 m, seemed to be very narrow, a hundred meters below *P. leiophylla* Schiede ex Schldl. & Cham. var. *chihuahuana* (Engelm.) Shaw and *P. lumholtzii* B.L. Rob. & Fernald to just above Yécora, where *P. engelmannii* Carr. takes over the area. Leaving Yécora, a few miles toward Obregon, we again came across scattered stands

of this species, but for only a few miles along the road. Interestingly, it was found again 100's of miles south of there, in the mountains of Sinaloa, along the road from Mazatlán to El Salto, Durango. With its distinct characters, we considered the latter to be a new geographical variety (see below).

CONSERVATION: It is located far from cities, so there was no opportunity to make steps in this matter. In the same area, other conifers such as *Pinus durangensis*, *P. engelmannii*, *P. herrerae*, *P. leiophylla*, *P. l. var. chihuahuana*, *P. lumholtzii*, *P. maximinoi*, and *P. oocarpa* Schiede ex Schlttdl. are common, but do not appear in distribution maps, suggesting that the area is not yet well explored. The tree seems to be restricted to the localized sites and protection of some populations should be considered.

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7. *Pinus yecorensis* Debreczy & Rácz var. *sinaloensis* Debreczy & Rácz, var. nov. "Pinus B" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Central Sinaloa, Capilla Textla, 1200 m, May 9, 1994, Debreczy, Rácz, Biró, et al. #39896 (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

A specie typica strobilis maturis (apertis) 4.5-6.5 cm longis, 4.5-6.0 cm latis et pedunculis 0.5-1.2 cm longis differt.

DESCRIPTION: general character is identical to that of *Pinus yecorensis* (above), but the trees are usually smaller (12-16 m tall); **needles:** narrower (1 mm; not 1.2-1.4 mm wide) with more dense serration (6-7/mm; not 4-5/mm) and with 3 stomatophorus lines on the dorsal sides, 2-3 lines on the two ventral sides (not 3-4 stomatophorus lines on the dorsal and 3 on the two ventral sides); **conelets:** about half in size (1.2 × 1.1 cm; not 2.0-2.5 × 1.5-2.0 cm) with smaller scales (1.8 × 1.2 mm; not 3.5-5.0 × 2.2-3.0 mm) and shorter (0.5-0.7 mm; not 1 mm) but often sharper prickles; **cones:** smaller (4.5-6.5 cm long, 4.5-6.0 cm wide when open; not 8-12 × 6-9 cm, or 8-12 × 7.0-9.5 cm when open), consisting of 80-110 (not 130-150) developed scales with elevated, usually rounded, occasionally conical and pointed apophyses (up to 7 mm) on one side, flat and rhombic on the side, facing to the branches, along with a peduncle of 5 to 12 mm; **seeds:** smaller (with wing, 1.4 × 0.4 cm), densely shaded with dark lines (not 3 × 0.9 cm and light brownish yellow).

NAME: after the Mexican state of Sinaloa in which the species was first found.

DISCOVERY: While traveling from Mazatlán, Sinaloa to El Salto, Durango we were surprised to see a similar (unknown) pine we found on the slopes around Yécora hundreds of miles north. It is fairly common on hot, dry, rocky slopes between 1,100 and 1,300 m altitudes for just a few miles above and below Capilla Textla, Sinaloa, 74 miles east of Mazatlán. It associates with *Pinus durangensis* and *P. maximinoi*, and as in around Capilla Textla, with *P. oocarpa* and *Quercus magnoliifolia*. The cones often remain on the branches for several years and, from a distance, the trees can easily be mistaken for *P. oocarpa*.

CONSERVATION: Steps will be taken in collaboration with the UCODEFO in El Salto.

PARTICIPANTS IN FIELD WORK: as with the above species.

8. *Pinus oaxacana* (Mart.) Mirov⁵ var. *diversiformis* Debreczy & Rácz, var. nov. Figure: Plate II:3; "Pinus C" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Oaxaca: south of the village of Ixtlán de Juárez, 2000 m, Feb. 26, 1994, Debreczy, Biró, Rácz, et al. #37897 (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

A specie typica ramulis olivaceo-brunneis, strobilis maturis angustioribus (12 cm longis, 6 cm latis), apophysi busque potius aequaliter protuberantibus differt.

NAME: (Lat. adj.: diverse = different; diversiformis = different form) to express its divergent characteristics, comparing it with the species, *Pinus oaxacana* (Mart.) Mirov.

DESCRIPTION: large tree, 20 m tall or probably more, with broad, rounded crown, very similar if not identical with that of *Pinus oaxacana*. The needles, 5 in a fascicle, long (25-30 cm) and fine, just like in the species but with a slightly different shade with less shiny bright green color. The branchlets are green first, soon yellowish green and brown, not bluish white pruinose as is typical in the species. The cones (just like those of *Pinus attenuata* Lemm. from a distance) are elongated ovate to cylindrical, typically twice as long as wide (12 × 6 cm) with elevated, but not strongly protuberant, spiny umbos (as it is in the species) and with slightly elevated scales with strong transverse keel toward the apex.

DISCUSSION: this pine, occurring sporadically above the Río Grande valley in Central Oaxaca, typically intermingled with the species and with other pines, is distinct with its narrower, more symmetrical cones (not strongly asymmetrical ovate) with short, evenly protuberant apophyses toward the base of the cone (not with 1.5-2.5 cm long, strong projection of the apophysis particularly toward the base on the dorsal [abaxial] side). The young branchlets are shiny green, later yellowish-greenish brown and finally brown, not pruinose bluish white.

DISCOVERY: while studying the variability of *Pinus oaxacana*, we encountered single trees and small groves of this variety, intermingled with the species and other trees between and around Ixtlán and Guelatao, Oaxaca, at 1,800-2,000 m. The natural association in the region of this conifer had been destroyed, and its occurrence by now is likely restricted to secondary grasslands and scrubs with scattered stands of *Acacia*, *Quercus*, woody *Verbesina*, and *Vernonia* species. Among conifers, besides *P. oaxacana*, only *P. leiophylla*, *P. lawsonii*, and *P. michoacana* was found to grow nearby.

CONSERVATION: as described above, this rare variety, found on both private and community lands, is an important pine from a phylogenetic aspect. Its scattered specimens and groups, intermingled with other species, can be preserved only after careful survey and mapping the specimens in collaboration with the local commissariat and conservancy personnel.

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9. *Pinus lawsonii* Roehl var. *gracilis* Debreczy & Rácz, var. nov. Plate II:4; "Pinus D" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994). TYPUS: MEXICO. Oaxaca: above the town of Oaxaca, 4 km below El Estudiantes on dry rocky outcrops, northwest facing slope, close to route #175, 1650 m, March 24, 1994, Debreczy, Biró, Rácz, et al. #38542a (HOLOTYPUS: BP; Isotypi: A, CHAP,E,MEXU,NA).

A specie typica foliis tenuioribus, multo elasticioribus, 1.0-1.2 mm latis, strobilis maturis lucidioribus, pedunculis eorum usque 1.5 cm longis, squamis strobilorum angustioribus (6-11 mm latis) magis flexibilibus, umboneque prominenti, aculeo brevi instructo differt.

NAME: (Lat. adj. gracilis = thin, slender) was chosen to express its fine foliage and relatively small cones.

DESCRIPTION: small to medium sized tree up to 15 m with typically rounded crown; **bark**: separated to wide, flat, densely scaly ribs, some easily detached plates and others, firmly attached and leaving chestnut brown patches, changing brown to light brown to ash gray with age, fissures orange red, conspicuous on rapidly growing trees when whole sections of the trunk show orange red; **branches**: upward curving, densely scaly, orange to reddish-brown with easily detached scales, the primary scales detach readily, replaced by thin bark scales; **buds**: small (1 cm long), pointed, reddish brown with a few white threads, bud scales (8 × 3 mm) narrow, triangular with wide hyaline margin at base; **branchlets**: thin (6-8 mm in lateral fertile shoots), densely covered with white bloom and narrow, nearly parallel sided scales; **leaves**: 3 in fascicles, 14-16 cm long, 1.2 mm wide on the dorsal side, 0.7 mm on the ventral side, the basal section covered up to 1.4 cm, partially eroded by the following year (0.4 cm) and remaining for 2 years, the initial scale pairs are papery thin with 9 stomatophorus lines on the dorsal side and 4 lines each on the ventral sides, densely serrate (60-68/cm) with small teeth (up to 0.16 mm long, with 0.03 mm clear tip); **conelets**: small (1.4 cm long), oval to ovate, abruptly contracted toward the base, consist of about 180 (56 on the contracted section), small (25 × 1.5 mm) scales, each with 0.5 mm long blunt prickle, directed (axilwise) upward on conspicuous (1.4 cm long), slender, recurved peduncle with easily detached scales; **cones**: developing on recurved, slender peduncle (1.3-1.5 cm long), firmly attached, non-serotinous, small 3-6 × 2.3-4.0 cm), ovate, widest above base or at the middle of their length, slightly asymmetrical, consist of 80-110 (6-22 × 5 developed) scales, irregularly rounded at upper margin, shiny brown, dark chestnut brown on dorsal side with a gray seed scale print and narrow blackish zone on ventral (adaxial) side around the seed scale, apophysis (5-9 × 2-4 mm at mid-cone) flat or slightly elevated with 3-5 clearly visible keels, umbo (3-4 × 2 mm) terminating in inconspicuous (0.4-10.0 mm long), blunt prickles directing forward (as to continuation of the scale); **seeds**: small (4.5 × 2.5 mm), ovate or rounded quadrangular, evenly brown, black and gray dotted, with small (1.2 × 4.5 mm), shiny purplish gray (light yellowish gray, delineated purplish gray) wing.

DISCUSSION: this interesting rare variety of *Pinus lawsonii*, with typically rounded crown, fine, flexible, gray to grayish green needles in threes and relatively small, shiny, ovate cones with prominent prickles and up to 1.5 cm long peduncle, grows in the lower limits of the distribution of the species. It differs from that with its slender needles (1.0-1.2 mm across), with narrow, 1.5 mm wide, enclosed basal section, at most 2.4 mm across, measured at the papery thin basal scales (not 2.4 mm wide and with conspicuous basal scale pair, 3.5 mm across); the needle is 1.2 mm

wide with 8-9 stomatophorus lines (not 2.2 mm wide with 12 stomatophorus lines), with its smaller (3-6 cm long) peduncled (1.3-1.5 cm long) cones with 80-110, thin, more flexible cone scales and slightly elevated umbo, open shortly after maturing (not up to 8 cm long and nearly sessile or subsessile with sometimes slight serotinous tendency); typically with up to 160 elevated cone scales abruptly prominent below the umbo. The related *P. teocote* which also occurs in the area, is a high altitude species with elongate purplish cones before ripening and with mid-spring (not late autumn-early winter) bloom and cannot be confused with our variety.

DISCOVERY: while documenting the variability of *Pinus lawsonii*, we found small stands and scattered individuals in two locations in the Sistema Montañoso del Norte de Oaxaca. The best trees are in the dry foothills of a wide valley just above the city of Oaxaca, about 4-5 km south of El Estudiantes at an altitude of 1650 m. This is the first conifer which appears while gaining altitude from the dry Altiplano. The other location is near a dirt road leading to the village of Ixtepeji at 1900 m.

CONSERVATION: we reported these locations to the Instituto Tecnológico de Oaxaca (Dr. Enrique Martínez), and the protection of this variety will be handled together with the other species and varieties of conifers in Oaxaca in cooperation with the local communities.

PARTICIPANTS IN FIELD WORK: as with the above variety and Earthwatch volunteers.

10. *Pseudotsuga menziesii* (Mirb.) Franco var. *oaxacana* Debrecezy & Rácz, var. nov. "*Pseudotsuga* A" in NewsBrief No. 6 of I.D.R.I. (Sep. 1994).
TYPUS: MEXICO. Oaxaca: Sistema Montañoso Norte del Oaxaca 15 km north of the town Oaxaca, Cerro San Felipe, on and below the huge limestone outcrop called Peña Prieta (Peña Piedra), NE slope of Corral de Piedra above the village El Estudiantes, at 2700 m, February 15, 1994, *Debrecezy, Biró, Rácz, et al. #37614* (HOLOTYPUS: BP; Isotypi: A,CHAP,E,MEXU,NA).

Arbor, ad 30 m alta; **habitus** anguste pyramidaliter columnaris; **truncus** rectus, diametro usque 80 cm; cortex sicut speciei: crassus, suberosus, costis altis; **rami** dense squamulosi, squamulis primordialibus vel residuis earum usque 8-10 annos persistentibus, postea lucide cinerei, porro concrecentes squamis corticalibus atrocinereis instructi; **ramuli** typice breviter sparsim pubescentes, pallide virides; **gemmae** 4 mm longae, 2 mm crassae, cylindricae, sanguineo-brunneae, non-resinosae, in siccitate squamis recurvatis; **folia** typice brevia et relative lata (1.0-1.7 cm longa, 1.0-1.2 mm lata), cinerascens, cinereo-viridia, lateribus parallelis, apice abrupte acuminata, mucronulata, pruinosa, in latere dorsali lineis stomatum nullis, in latere ventrali limitibus 2, uterque lineas 4 glaucas stomatum ferentibus; folia margine conspicuo (1.6 mm lato) et costa media crassa (0.20-0.25 mm); **strobili juveniles** ineunte mensis Martii apparentes, strobili juveniles feminei rosacei vel pallide virides typice pruinosi, 1.5-2.0 cm longi, 0.6-1.0 cm lati, strobili juveniles masculini 8 mm longi, 5 mm lati; **strobili maturi** parvi, 2-4 cm, raro 6.5 cm longi, saepe squamis minoribus quam 10, plerumque 25 squamis rotundatis, squamae 1.5 cm longae, 2.2 cm latae, dense pilosae, in latere externo prominenter venosae; bractee conspicue longae, in sectione media strobili 2 cm longe exsertae, variabiles; semina pallide brunnea, 4 mm longa, 3 mm lata, alae 7-8 mm longae, 3-4 mm latae.

DESCRIPTION: Narrow columnar tree up to 30 m tall with first upcurving, later ascending-upcurving, short main branches forming a columnar pyramidal habit, with trunk diameter up to 80 cm; **bark:** thick with high ribs, suberous like in the smaller trees of the species; **branches:** densely scaly with primary scales or remnants up to 8-10 years, shiny gray, later replaced by thin, gray to dark gray cortical scales; **buds:** (4 × 2 mm) cylindrical reddish-brown, not resinous, the lower scales recurved in dry weather; **branchlets:** typically short, relatively thick (1st year 3 mm across), sparsely pubescent, first light green, later purplish brown; **needles:** typically short and relatively wide (1.0-1.7 cm × 1.0-1.2 mm), parallel sided, abruptly acute, mucronulate at the end, deeply grooved above the midrib, pruinose without stomatophorus lines above, with two stomatophorus bands below on the upper, adaxial surface, with 4 glaucous lines in each and conspicuous but narrow (0.16 mm) margin and strong (0.2-0.3 mm) midrib; **cone inflorescences (strobiles):** appears in early March, female- (1.5-2.0 × 0.6-1.0 cm) pink or green, typically pruinose; male- (0.8 × 0.5 cm): light yellow to pinkish yellow; **cones:** 2-4 × 1.5 cm, rarely up to 6.5 cm long, with often less than 10, otherwise 25, rounded, relatively small cone scales wider than long (1.5 × 2.2 cm), with dense, appressed, short (0.25 mm) hairs; the cone scales are prominently veined on the abaxial (dorsal) side; there are shorter hairs inside around the two, smooth seed prints (9 × 4 mm); bracts exerted, slightly longer than the mid-scales, upcurving toward the base (before the cone matures or when wet), 2 cm long at the widest scales, narrow (3 mm wide) and serrate below the middle, usually tricuspidate with short points on the outer edge of the wings forming a short stemmed, often "closed", "V" from 5 mm below the shortly protruding tip, becoming needle-like or nearly so; lateral lobes of the bract are inconspicuous or absent toward the base; **seeds:** (old when observed) 4 × 3.0-3.5 mm, light yellowish gray-pale brown with 9 × 4 mm wing, light grayish yellow in color with or without a few short brownish lines.

NAME: after the state of Oaxaca in southern Mexico, where it was found. The locality is just 15 km as the crow flies from the capital of the state, with the same name, Oaxaca de Juárez.

DISCUSSION: this narrow columnar Douglas-fir (from a distance appearing like cultivated *Cupressus arizonica* Greene) with grayish foliage and small cones, was found around a huge limestone rock, Peña Prieta (Peña Piedra), on the northeastern slope of a valley in the San Felipe Mountains at 2700 m altitude, a few miles north of the town of Oaxaca. Following this, on June 28, 1994, Prof. Boone Hallberg of the Instituto Tecnológico de Oaxaca reported that "Sr. Evodio, consejo de Vigilancia, Ixtepeji and Sr. Alfredo Yescas" located the tree in Rosa Blanca, a few kilometers north of the first location. Since September, the species has also been reported from the (newly identified) highest mountain 3751 m, 12, 303' [not Cerro Zampoaltepétl, 3395 m(!) known previously as the highest] of Oaxaca (according to Boone Hallberg, "from lat. 15°22' N, long. 96°06' W; must be 16°22' N, 96°06' W, Cerro Quiexobra, Sierra Madre del Sur(!) 110 km SE of the town of Oaxaca, 35 km SE of Miahuatlán de Porfirio Díaz). All these data indicate how widely the species had been distributed in a cooler, relatively more humid period. Applying *Pseudotsuga menziesii* in a broad sense, this location represents the southernmost distribution of the species and, simultaneously, that of the entire genus worldwide (*P. wilsoniana* Hay. and *P. brevifolia* W.C. Cheng & L.K. Fu grow near the 22nd latitude in Taiwan and in south China, respectively). To understand the systematic position of our variety, it is necessary to evaluate the relationships of all species described from México with those in the north and evaluate this new variety within that relationship. As discussed in the

introduction, species such as the north Mexican *P. flahaultii*, *P. rehderi*, *P. guinieri* and the one, considered the southernmost member of the "menziesii group", *P. macrolepis*, are not consistent in their morphological characters and better to be considered a synonym of *P. menziesii*. This is why the Oaxacan Douglas fir is better treated as the southernmost and isolated variety of the main species (see introduction).

DISCOVERY: we found this variety in the San Felipe Mountains at 2700 m altitude, north of the city of Oaxaca. It associates with *Pinus oaxacana*, *Pinus pseudostrobus* Lindl. (including var. *megacarpa* Loock), and *Pinus teocote*, *Arbutus xalapensis*, *Litsea glaucescens*, *Prunus serotina* subsp. *capuli*, *Quercus candicans* / *calophylla* Cham. & Schltld., *Q. crassifolia* H. B. K., *Q. laurina*, and *Q. castanea* in the upper level and *Comarostaphylis konzattii larguta*, *Senecio angularis* auct., *S. barba-johannis* DC. in the scrub, *Gaultheria hirtiflora*, *Pernettya ciliata* Small, *Vaccinium confertum* H. B. K., with a rich (*Thuidium*, *Polytrichum*) moss level with *Sedum*, *Crassula*, Pteridophytes (*Elaphoglossum*, *Adiantum*) and a few herbaceous plants such as *Heuchera*, in the lower scrub level. High stemmed (2-4 m tall) *Dasylyrion lucidum* auct. with nodding terminal is common in the shade of the trees. The small forest in the deeper soil under the big rock is rather poor in the number of species. The associations of the species in this location are distinct from any other location of the Douglas firs.

CONSERVATION: the area was visited by professors from the Instituto Tecnológico de Oaxaca and representatives of the Oaxacan and local governments. With the new discovery of Douglas fir in the nearby Peña Rosa, two patches, each not more than 2-3 hectares has been known. Even if the most recent discovery of Douglas-fir (evidently the same variety) in Cerro Quiexobra, raises the number of the known locations to three, the tree should still be considered rare and very local, necessitating designation of all known locations for strict conservation policy. The protection of two locations of this rare tree, together with other rare taxa found in the larger area, is proceeding as suggested, within the framework of a proposed "San Felipe National Park".

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LITERATURE

- Farjon, A. 1993. Names in current use in the Pinaceae (Gymnospermae) in the ranks of genus to variety. NCU-2, Regnum Vegetabile vol. 128.
- Ferré, Y. 1941. La place des canaux résinifères dans les feuilles des Abiétinées. Trav. Lab. For. Toulouse. T. I, III, art. XII. Toulouse, France.
- Gausсен, H. 1971, 1973. *Les Gymnospermes Actuelles et Fossiles*. Fasc. 4 and 12. Toulouse, France.
- Hallberg, B. 1994. Hallazgo de un nuevo género de conífera. Noticias, Domingo 27 de Febrero de 1994., p. 9a. Oaxaca de Juárez, México.
- Hallberg, B. & E. Martínez y Ojeda. 1994. Coníferas en peligro de extinción. Noticias, Viernes 27 de Mayo de 1994., p. 9a. Oaxaca de Juárez, México.
- Liu, Tang-Shui. 1971. *A Monograph of the Genus Abies*. pp. 607. Taipei, Taiwan
- Martínez, M. 1948. *Los Pinos Mexicanos*. pp. 361. Ciudad de México, México.
- Martínez, M. 1942, 1963. *Las Pinaceas Mexicanas*; pp. 399. Ciudad de México, México.
- Orr, M.Y. 1937. On the value for diagnostic purposes of certain of the anatomical features of Conifer leaves. Not. Roy. Bot. Gard. Edinb. vol. XIX. Edinburgh, Great Britain.
- Perry, J., Jr. 1989. *The Pines of Mexico and Central America*. Timber Press, Portland, Oregon.

¹A compact tree (6 × 5 m) with very dense foliage was located in the land of Ixtlán de Juárez, which would be valuable for gardens in zone VIII-IX; for availability and further reference, contact Mr. Gustavo Santiago Ramírez, Ixtlán de Juárez, Oaxaca. Gray-blue forms of *Pinus lawsonii* are particularly spectacular in Guerrero, in the Chilpancingo region, e.g., along the road from Xochipala to Yextla.

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⁵Note: We believe that *Pinus oaxacana* (Mart.) Mirov should be the properly authorized name. No better description with precise and clear illustrations could be given, than what was provided by Maximino Martínez with his *P. pseudostrobus* Lindl. var. *oaxacana* Mart. Unfortunately, in most literature Martínez's name has been improperly dropped after Mirov elevated the variety to species rank.